6 Diary studies

Capturing real-time experiences in the workplace

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6.1 Background

The diary research method involves regular, predominantly quantitative self-reports over an extended period with the aim to capture experiences or phenomena whilst near their time of occurrence (e.g., Bolger & Laurenceau, 2013; Iida et al., 2012; Nezlek, 2020; Reis & Gable, 2000). Depending on the research field and era, diary research methods have also been referred to as *intensive repeated measures, intensive longitudinal methods, experience sampling,* or *ecological momentary assessment* (cf. Iida et al., 2012; Nezlek, 2020). In its structured form, diary research methods originated from the social sciences (primarily psychology and anthropology), but humanities (history and literature) were early adopters and used individual diary accounts as historical records to gain insight into eras, events, and "Life as it is lived" (Bolger & Laurenceau, 2013, p. 1; Iida et al., 2012). Diary studies are useful for studying phenomena/processes that rely on the integrity and authenticity of a real-life setting that cannot be studied in a laboratory and when the study focus is on variability in the environment (Ebner-Priemer & Kubiak, 2007; Nezlek, 2020). Diary studies can unveil the fluctuating nature of thoughts, feelings, and behaviours, their antecedents, and their dependence upon situational conditions. As such, this method drastically increases accuracy in formulating and testing hypotheses (e.g., Ohly et al., 2010). As organizational research has shown, there is an astonishing number of organizational and workplace phenomena, often assumed to be stable and hence assessed with cross-sectional methods, that are fluctuant and/or context-dependent (Bissing-Olson et al., 2015; Ohly et al., 2010). These include, for example, work engagement (e.g., Xanthopoulou et al., 2009), work performance (e.g., Binnewies et al., 2009), pro-environmental behaviour (e.g., Bissing-Olson et al., 2015) but also emotional states (e.g., Zohar et al., 2003; cf. Ohly et al., 2010 for a review of diary studies in organizational research). The happy, productive workers' thesis provides an

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illustrative example as listed by Ohly et al. (2010) (Fisher, 2003). The thesis is supported by a strong relationship between workers' job performance and job satisfaction when studied longitudinally on an individual level by comparing an individual's job performance at times when they are feeling satisfied to times when they are not feeling satisfied (within-subject approach; Fisher & Noble, 2004). However, the thesis is rather unsupported when studied cross-sectionally on a group level by comparing individuals who feel satisfied to those who do not (between-subject approach; Thoresen et al., 2004). As such, diary studies are useful in uncovering dynamic processes between and within individuals in a specific context, such as in an organization or the workplace. Since diary studies contain daily assessments, they could be classified as longitudinal studies. However, their main scope is not on long-termed developments but on daily fluctuations. Therefore, they comprise repeated and frequent assessments of the same constructs. Ideally, they do not contain any retrospective assessment of certain periods, but the assessment aims at the current experience.

6.2 Argument

6.2.1 Diary study designs

Over the past four decades in which diary studies have been used in social sciences, it has been increasingly refined and evolved, especially with the implementation of new technologies (cf. Iida et al., 2012). As such, its application in organizational research has increased over the past few years, especially on research topics concerning occupational health and well-being (cf. Ohly et al., 2010 for an overview). Different types of diary study designs exist, and whilst there are different categorizations (daily diaries, experience sampling, and event sampling, cf. Conner & Lehman, 2012; Ohly et al., 2010), the conservative categorization differentiates three types: time-based (also interval contingent or experience sampling), event-based (also event contingent or event sampling), and device-contingent designs (cf. Iida et al., 2012; Wheeler & Reis, 1991).

Time-based methods collect data according to a time-based log (e.g., every day at noon). *Event-based* methods collect data according to a focal experience of the participant (e.g., social interaction; cf. Rochester Interaction Record; Reis & Wheeler, 1991; Wheeler et al., 1983). *Device-contingent* methods collect data according to changes in participants' physiological condition (e.g., heart rate variability; Baethge et al., 2020) or surroundings (e.g., context-aware experience sampling; Intille et al., 2003) detected by a device. A combination of devices can be used (e.g., e-diaries and wearables; Bernstein & Turban, 2018; Kyriakou et al., 2019). Both the time-based and device-contingent methods can be conducted as *signal-contingent* studies when data collection is prompted by a signal from a device (also referred to as beeper studies or experience sampling; Csikszentmihalyi & Larson, 1987). This can sometimes include random data collection intervals. However, selecting an appropriate method, frequency, and time span for the data collection requires careful consideration and depends on the phenomena and research questions of interest, which will be further elaborated on in the following sections.

6.2.2 Practical considerations concerning study design

Each study design type has its own set of pros and cons: *Time-based* methods use different frequencies (once/a few times a day, once/a few times a week, and so forth) and time spans of data collection (days, weeks, or longer). Frequency and time span "need to be often and long enough to provide a sample of people's lives that is sufficient to provide a basis for making inferences about the topic of the study" (Nezlek, 2020, p. 2). This means, that picking a sensible interval and time span is not only dependent on the research question but also on the concept, process, or phenomena of interest (cf. Iida et al., 2012). For example, some processes change quickly and require shorter intervals for detection than others (e.g., mood, such as workplace satisfaction vs. trait perception, such as personality). This means, that some effects can become undetectable if too much time passes; for example, in coping research, the effect of anxiety is too small to be detected when being assessed a week or longer after coping has occurred (cf. Iida et al., 2012). This could be transferred to workplace research, for example, in a scenario when emotional work outcomes (e.g., emotional exhaustion) are assessed after environmental control perceptions over a socio-environmental stressor (e.g., work privacy invasion). Other effects take longer to manifest and could be missed by using too short intervals (e.g., actual week-to-week changes assessed one week daily). However, too long intervals may lead to the risk of introducing recall bias (Shiffman et al., 2008); recall bias will be less of an issue when data is collected hourly as opposed to once a day. For example, in a study on creativity at work, daily creativity was self-assessed twice a day as creativity is acknowledged to be fleeting (Amabile et al., 2005), whereas overt work behaviours (e.g., proactive behaviour) stay in memory and were assessed once a day (Fritz & Sonnentag, 2009). From a participant's perspective, shorter intervals create a burden for participants; hence the overall investigation period might require shortening. Further, frequencies or intervals chosen must be convenient for participants to ease the burden of regular participation. Concerning time-based methods, the exact timing that is suitable to study processes of numerous phenomena is often unknown; fixed intervals must be decided based on an adequate theory base. If this is not possible, shorter intervals are recommended (Collins, 2006).

Event-based methods require a clear, non-ambiguous definition of the event/phenomena of interest (e.g., invasion of workplace privacy) and rely heavily on the compliance and judgment of participants. Piloting studies are highly recommended to clarify any questions concerning ambiguous events, e.g., what are the components of work privacy and how does it differ from related concepts such as crowding or territoriality, how do participants know when their work privacy is violated, what are related examples which do not classify as work privacy. With an appropriate definition and reliable registration of the relevant events, the measurement is very close to the immediate experience of these events.

Device-contingent methods come with disadvantages that should be considered when designing a diary study. Reliance on the signalling device requires adequate setup and programming. Further, carrying the device and the frequent signalling disrupt participants' daily routines and may hamper their compliance (Iida et al., 2012). However, regarding the increasing prevalence of smartphones, specialized devices are not necessary in specific cases. For example, the intensity of daily

smartphone use could be recorded by the devices themselves, using specified applications installed on the phones. Also, self-monitored health checks, e.g., step counts and pulse counts, have become quite normal and integrated with parts of the population's daily routines since the usage of smartwatches has increased.

Practical considerations and limitations concerning all types of designs include: Requirement of an in-depth briefing of participants; the requirement of a high level of participant commitment to ensure data validity and reliability; participant burden through survey length, frequency, and study length causing poor data and attrition; balancing information yield vs. participant burden; balancing sample size, length, and frequency of assessment vs. resources (money and effort); gauging sample size requirement vs. frequency of assessment/data points (focus on the sample size if interested in between-subject difference; focus on data points if interested in event effects within a person); bias introduced by diary reporting process (e.g., Iida et al., 2012); inability to derive cause-and-effect claims but can detect direction and time-sequence of correlated effects (concerning causal thinking, diary studies are better than cross-sectional studies).

If using questionnaires for data collection, the same questionnaire must be completed multiple times, which challenges the motivation and compliance of the participants (Ohly et al., 2010). Therefore, the questionnaires should be very short and contain a few questions. Regarding these restrictions, scales that consist of more than a few items could be abbreviated by selecting items with the highest item-total correlation (cf. Ohly et al., 2010).

6.2.3 Methodological considerations concerning data analysis

Data analysis of diary studies requires advanced statistical skills. In particular, multilevel analyses are preferred for several reasons. First, missing data at individual points in time do not lead to a large reduction in the sample. If a participant does not complete the questionnaire at a time point, the remaining data of this participant are still considered for the analysis. On the contrary, in analyses of variance for repeated measures, missing data lead to the exclusion of all data of one participant, which quickly reduces the amount of data, especially if many measurement time points are included. This is also an important advantage since diary studies require a high willingness and discipline from the participants (Ohly et al., 2010). For more details: Grund et al. (2019) provided an introduction to handling missing data in multilevel research. Second, since not all participants will complete the questionnaires at the same point in time, time could be mapped with the actual time instead of survey measurement points, which leads to correct interpolations between the time points. For example, a web-based survey could automatically record the time of completion of the questionnaire, and in the statistical analyses, this time goes into "days since the start of the study", which correctly represents time gaps of different lengths between the measurement points. Third, capturing multiple time points allows for modelling curvilinear relationships over time (cf. Ohly et al., 2010 for a detailed discussion of research question examples).

Finally, and of particular importance, multilevel analysis allows the differentiation of between-subject and within-subject effects, for example, by centring on the mean of an individual (within-subject centring; cf. Curran & Bauer, 2011; Singer & Willett, 2003). The differentiation of these effects allows a finer-grained view of

influencing variables at different levels. For example, the number of incoming calls may differ daily, and days with many calls may be perceived as more stressful by the same person (within-subject effect). In addition, the workplaces differ regarding the number of incoming calls, as this could be the case for an archivist or a call centre agent (between-subject effect). Furthermore, centring is particularly important when testing for indirect effects from within the multilevel analysis framework (Zhang et al., 2009), which should rely on within-subject effects while statistically controlling for between-subject effects.

Overall, designing a workplace diary study requires consultations with someone experienced in these research methods to help weigh the pros and cons of study design characteristics, flag potential (analytical) problems, and discuss strategies for statistical analyses.

6.3 Examples of application/use

In this section, we present diary studies exemplifying the above considerations concerning study design and data analysis in detail. First, we present a diary study on daily supervisor feedback and its effect on perceived work resources and work engagement. Second, a study on daily interruptions at work addresses questions on different recording methods of events in diary studies. Third, we present two studies on workplace design and well-being that used device-based measurements. Finally, we introduce and discuss an innovative measurement approach, namely the use of pictorial scales.

These examples should provide some inspiration and guidance on applying the methodological approach to one's research. The different methodological approaches to assess daily events or measures such as questionnaires, tally sheets, physiological measurements, or pictorial scales should be noted. Though these are different approaches to measurement, the statistical analyses follow the same pattern, namely distinguishing between persons' mean levels (between-subjects effects) and daily fluctuations around a person's mean level (within-subject effects).

6.3.1 Assessing daily experiences and consequences: Effects of daily supervisor feedback

Today's working life is increasingly characterized by virtual, flexible, and self-determined work arrangements. In such circumstances, supervisor feedback can be a powerful job resource and thus a key driver of work engagement. In a diary study, Soucek and Rupprecht (2020) investigated the contribution of day-to-day supervisor feedback concerning job resources and work engagement. The study aimed to investigate the effect of receiving or not receiving supervisor feedback and contrasted two feedback sources, face-to-face feedback versus digitalized feedback, using a computer-mediated feedback system.

Concerning the study design, participants indicated over one month every workday whether they received supervisor feedback and assessed daily job demands as well as how engaged they felt after each day at work. Overall, this diary study

consisted of 24 daily repeated questionnaires and was statistically analysed using multilevel models. The daily measurement points were recorded on Level 1 and the participants' reactions on Level 2 (Singer & Willett, 2003). As participants answered the questionnaire only during workdays, this fact results in unequal periods between the measurement times. Therefore, the time variable was assessed in days starting with zero on the first day of the study and later the corresponding day was recorded. This procedure correctly operationalized time, even if the participants answered the daily questionnaires at irregular intervals.

Due to the questionnaire being answered 24 times, the respective constructs are liable to variation between the measurement points (Level 1) and between persons (Level 2). Therefore, individual values for the measured job demands and job resources were centred before being entered as predictors in the multilevel models (within-subject centring; cf. Curran & Bauer, 2011; Singer & Willett, 2003). This procedure resulted in two different predictors. One indicates the average level over the 24 measurement points for every person (between-subjects effect) and the second indicates a person's daily deviations of the person's average value (within-subject effect). This differentiation is particularly important when making statements about the mechanisms behind the systematic change. For example, the between-subjects effect can be influenced by personal characteristics or by attributes of the particular workplace. The within-subject effect contrasts days with higher and lower demands as perceived by the same person. Also, an indirect effect was tested within the framework of multilevel analysis by relating the hypotheses to the within-subject effect at Level 1 while controlling for the between-subjects effect at Level 2 (2-1-1 model; Zhang et al., 2009). In the present study, Soucek and Rupprecht (2020) tested for the indirect effect of supervisor feedback on work engagement using job resources.

6.3.2 Recording of events in diary studies: Daily interruptions at work

The ongoing digitalization and flexibilization of workplaces have expanded and shaped the way of working (Korunka & Kubicek, 2017). Accelerated by the pandemic, communication and collaboration are often media-based, leading to many communication channels and frequent interruptions by emails, instant messages, and video calls. However, assessing interruptions and their consequences is challenging because they distribute throughout a working day and across various media and communication channels (e.g., emails, corporate social networks, and collaboration platforms). Therefore, the assessment of interruptions must rely on recordings by the persons themselves or observations in the workplace. Questionnaires at the end of each working day could be a solution but may be subject to recall bias.

Ebner et al. (2022) investigated the association between daily work interruptions and stress. Thereby, they used two methods to record daily interruptions. In particular, Ebner et al. (2022) prepared a booklet that allowed immediate logging of interruptions with a structured tally sheet that differentiated between various sources of interruption, such as work-related or private interruptions. Participants were instructed to note interruptions as soon as they occurred. In addition to these

tally sheets, participants completed a questionnaire on perceived interruptions and indicators of well-being such as psychological detachment.

The study of Ebner et al. (2022) relied on multilevel analyses. The hypotheses were tested on the basis of within-subject effects (i.e., daily interruptions compared to a person's mean level of interruptions) while controlling for between-subject effects (i.e., the mean level of interruptions per person due to each specific work environment). To put it more simple: Days with more interruptions than usual were associated with a lower level of psychological well-being than days with a lower number of interruptions. Furthermore, the results of the diary study by Ebner et al. (2022) indicated that interruptions logged throughout the day were related to the perceived level of interruptions at the end of the day. However, trait-like constructs, such as Fear of Missing Out also influenced the perceived interruptions but not the logged interruptions. This study illustrates the differences between various methods of recording daily events and how the characteristics of the participants influence them.

6.3.3 Device-based measurements in diary studies: Workplace designs and well-being

When conducting workplace research via workshops, observations, interviews, or surveys, workplace users often claim that no week is like the other, no day is like the other, or no hour is like the other. Employees are often not able to report "an average" of time spent in different spaces or distinguish their time spent with different activities and their satisfaction with the work environment to support their activities. To investigate employees' activity, environmental assessments, or mobility profiles, diary methods are easy to use and more precise than letting employees guess about their experiences from a few days ago.

For example, Lindberg et al. (2018) explored the association between workplace design, employee health, and well-being from an occupational health perspective. They measured employees' heart rate variability with a chest-worn sensor, perceived levels of stress via a smartphone app, and physical activity by a triaxial accelerometer sensor on three consecutive workdays. They found that workers in both private offices and traditional, high-partition cubicles were less physically active than workers in open bench seating arrangements to a degree shown to be clinically meaningful in other populations. In addition, higher physical activity levels at the office were clinically meaningful and related to lower physiological stress levels outside the office, indicating careful decisions on workplace layouts and designs to keep sick leaves to a minimum. Also, they found that female workers exhibited significantly lower physical activity levels at the office and higher physiological stress outside the office, pointing to gender-oriented workspace improvements.

In another study, Thayer et al. (2010) examined the effects of physical work environment features on employee stress reactions. Employees' work environment satisfaction and physiological stress working at comparably large workspaces without skylight and no transparent view from the window ('old') were compared with employees' physical and mental reactions working at comparable smaller workspaces but with skylight and transparent windows ('new'). Cardiac activity was measured continuously by using a mobile device. And salvia samples were

taken by the employees themselves at certain events during the day to measure cortisol. Finally, the workers reported hourly, prompted by a tone, on the handheld device to what extent, e.g., they had felt stressed, were satisfied with noise/privacy, ventilation, lighting, and views, as well as their consumed units of tobacco, coffee, and alcohol. When the employees answered the first question of each entry of the log, the present time was stored to enable comparison between their questionnaire responses on the smartphone and the cardiac measurements. Using this dairy approach, Thayer et al. (2010) found evidence for greater stress in employees working in a darker workplace with no direct reference to the outside compared to those in lighter workspaces and views with transparent windows. These results can inform management on how to prioritize their investments in a company's work environment, e.g., workspace size vs. lighting and view.

6.3.4 Pictorial scales in diary studies: Daily fluctuation of work intensity

Since diary studies may contain a lot of repeated questionnaires with the same questions, word-based questionnaires might hamper participants' motivation and compliance over time. With diary studies in mind, Soucek and Voss (2022a) developed and validated a questionnaire and pictorial scales on work intensity. The pictorial scales consist of seven pictures representing one of the seven facets of work intensity (Soucek & Voss, 2022a). Each scale comprises five pictures following the idea of a Likert scale. Figure 6.1 shows the pictorial scale of the facet "interruptions at work" which depicts five levels of interruption intensity in five successive pictures. The pictorial scales are available under a Creative Commons License (Soucek & Voss, 2021) and are described by Soucek and Voss (2022b) in more detail concerning their application.

These pictorial scales were used in a diary study that was conducted by a public authority switching from paper-based files to digital files. The study aimed to investigate daily fluctuations in work intensity and their association with job satisfaction. Work intensity was assessed with a series of seven pictures (Soucek & Voss, 2021), and the assessment of job satisfaction relied on a series of circular faces with different mouth curves (Kunin, 1955). The pictorial scales were distributed to employees as printed booklets, including 10 pages for 10 consecutive working days. After the study, the booklets were recollected.

Statistical analyses conducted person-mean centring (cf. Curran & Bauer, 2011; Singer & Willett, 2003) to differentiate between-subjects and within-subject effects. Overall, the pictorial scales evoked sufficient within-subject variance, and

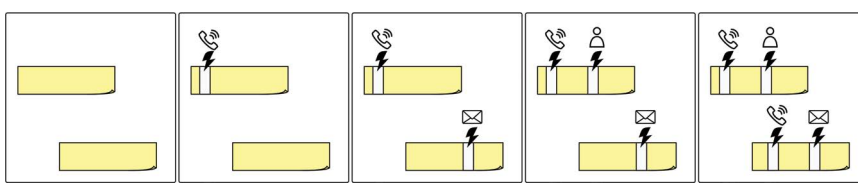

Figure 6.1 Example for a Pictorial Scale: Interruptions (Soucek & Voss, 2021)

results indicated that daily fluctuations of work intensity were associated with daily levels of job satisfaction. Of note, statistically controlling for between-subjects effects utilizing person-mean centring also solved the potential issue of employees' different interpretations of the pictorial scales because testing of the hypotheses relied on the within-subject effects. Overall, the pictorial scales are meeting the demand for a simple, concise instrument that allows for repeated measures, such as in the context of diary studies.

6.4 Implications

6.4.1 Diary method relevance to research

Diary studies can drastically enrich workplace research as it increases rigour in the assessment of phenomena (thoughts, feelings, and behaviours) that are dynamic in their nature, and not stable across contexts and time, which is true for many workplace-relevant phenomena (e.g., employees' satisfaction, performance, or mood). Accuracy can also be gained in intervention studies, as individuals' behaviours (or other reactions) might not have been stable before and might not stay stable after an intervention has occurred. Furthermore, diary studies in workplace research can be combined with other innovative methodological approaches with endless possibilities. For example, investigating the discrepancy between self-rated indoor quality ratings, moderating factors (perception of environmental control), and objective physical measurements (e.g., acoustics). Another area of application could be the assessment of environmental stress (e.g., crowding), moderating factors (e.g., stimulus screening abilities of the individual), and the assessment of physiological stress reactions (e.g., heart rate). Also, the possibility of conducting studies using experience sampling is on the rise (Thai & Page-Gould, 2018).

Overall, diary-style methods allow for more differentiated and accurate investigations (direction and timely order of correlated effects) than prevailing cross-sectional studies. Although only experimental designs reserve the right to derive cause-and-effect relationships, "relative to cross-sectional studies, diary studies are a giant leap forward for causal thinking" (Iida et al., 2012, p. 283). Furthermore, as identified by Ohly et al. (2010), diary methods can advance our understanding in organizational or work research by fostering a process perspective enabling "us to learn more about changing states over time and about how specific states and behaviours translate into other states and behaviours" (p. 85). With diary methods increasing in organizational psychology research and advancing our understanding in this discipline (Ohly et al., 2010), we hope similar effects can be reached in the workplace research discipline.

6.4.2 Diary method relevance to practice

Change management tool. Diary-style methods can aid in getting buy-in from employees and employers for workplace design or change initiatives. First, by reflecting on when, where, and why things are being done, employees can realise that

they spend time in different kinds of spaces (not only at their desks). Thus, the 'why' of flexible workplace concepts, including open layouts and desk sharing, can be explained more succinctly. Second, diaries can be used as a self-reflection method and a (self-)coaching tool by which employees of all hierarchy levels can gain new competencies when using spaces. For example, if persons realize doing concentrated work in a crowded space simply out of habit, they can decide to find a better place for this activity. This way of reflecting on user behaviour and workspace experiences can also be done in groups. Thereby, one person's experience can serve as an example of good practice for others.

Tool for continuous organizational learning. Finally, diaries can be used as a tool for the continuous improvement of organizational practices. For example, Becker et al. (2021) found in a diary study conducted in three multinational companies that workspaces in an open office are perceived as less suitable for tasks that demand great concentration. However, for the home office, this did not apply. Companies can use such results to improve their workplace concepts: Where and when should concentrated work be done? Are better or additional spaces required in the office? To evaluate the success of possible changes (like in office design or workplace protocols), diary tools can again generate valuable insights.

6.5 Conclusions

Diary studies can provide a solid empirical foundation for evidence-based decisions in management. Applying a triangulation of different objective and subjective data sources from individuals, the building and indoor environment monitoring, even more, improves the decision basis for future work environment investments (cf. Geng et al., 2019). Especially in piloting expensive building optimization measures and change management, they can accompany organizational interventions and reveal critical mechanisms concerning their effectiveness. Sophisticated statistical analyses differentiate between people and the changes within people over time, including contextual and individual factors impacting these trajectories. However, diary studies are time-intensive and require experienced research competencies with advanced skills in statistical analyses. And the implementation of diary studies requires good preparation to ensure employees' willingness and compliance to participate. In line with Fisher and To (2012), workplace researchers may also plan a single study while addressing several non-overlapping sets of workplace research questions simultaneously.

6.6 Further reading

Full guide to diary style studies: Mehl, M. R., & Conner, T. S. (2012). *Handbook of research methods for studying daily life*. Guilford Press.

A guide on how to conduct and analyse diary style studies: Nezlek, J. B. (2012). Diary methods for social and personality psychology. In J. B. Nezlek (Ed.), *The SAGE library in social and personality psychology methods*. Sage.

A guide on how to conduct and analyse diary style studies with a focus on interval or signal contingent methods: Bolger, N., & Laurenceau, J.-P. (2013). Intensive longitudinal methods: An introduction to diary and experience sampling research. In T. D. Little (Ed.), *Methodology in the Social Sciences*. Guilford Press.

References

Amabile, T. M., Barsade, S. G., Mueller, J. S., & Staw, B. M. (2005). Affect and creativity at work. *Administrative Science Quarterly*, *50*(3), 367–403. https://doi.org/10.2189/asqu.2005.50.3.367

Baethge, A., Vahle-Hinz, T., & Rigotti, T. (2020). Coworker support and its relationship to allostasis during a workday: A diary study on trajectories of heart rate variability during work. *Journal of Applied Psychology*, *105*(5), 506–526. https://doi.org/10.1037/apl0000445

Becker, C., Soucek, R., Gunkel, J., Lütke Lanfer, S., & Göritz, A. S. (2021). Diary study of activity-based flexible offices. *Zeitschrift für Arbeits- und Organisationspsychologie*, *65*(3), 153–164. https://doi.org/10.1026/0932-4089/a000359

Bernstein, E. S., & Turban, S. (2018). The impact of the 'open' workspace on human collaboration. *Philosophical Transactions of the Royal Society B*, *373*(1753), 20170239. https://doi.org/10.1098/rstb.2017.0239

Binnewies, C., Sonnentag, S., & Mojza, E. J. (2009). Daily performance at work: Feeling recovered in the morning as a predictor of day-level job performance. *Journal of Organizational Behavior*, *30*(1), 67–93. https://doi.org/10.1002/job.541

Bissing-Olson, M. J., Fielding, K. S., & Iyer, A. (2015). Diary methods and workplace proenvironmental behaviors. In J. L. Robertson & J. Barling (Eds.), *The psychology of green organizations* (pp. 95–116). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199997480.003.0005

Bolger, N., & Laurenceau, J.-P. (2013). Intensive longitudinal methods: An introduction to diary and experience sampling research. In T. D. Little (Ed.), *Methodology in the social sciences*. Guilford Press.

Collins, L. M. (2006). Analysis longitudinal data: The integration of theoretical model, temporal design, and statistical model. *Annual Review of Psychology*, *57*(1), 505–528. https://doi.org/10.1146/annurev.psych.57.102904.190146

Conner, T. S., & Lehman, B. J. (2012). Getting started: Launching a study in daily life. In M. R. Mehl & T. S. Conner (Eds.), *Handbook of research methods for studying daily life* (pp. 89–107). The Guilford Press.

Csikszentmihalyi, M., & Larson, R. (1987). Validity and reliability of the experience-sampling method. *The Journal of Nervous and Mental Disease*, *175*(9), 526–536. https://doi.org/10.1097/00005053-198709000-00004

Curran, P. J., & Bauer, D. J. (2011). The disaggregation of within-person and between-person effects in longitudinal models of change. *Annual Review of Psychology*, *62*(1), 583–619. https://doi.org/10.1146/annurev.psych.093008.100356

Ebner, K., Wehrt, W., & Soucek, R. (2022). "*I get interrupted, I get stressed - and I still miss out!" Fear of Missing Out as a moderator of the relationship between daily interruptions at work and stress* [Manuscript submitted for publication].

Ebner-Priemer, U. W., & Kubiak, T. (2007). Psychological and psychophysiological ambulatory monitoring: A review of hardware and software solutions. *European Journal of Psychological Assessment*, *23*(4), 214–226. https://doi.org/10.1027/1015-5759.23.4.214

Fisher, C. D. (2003). Why do lay people believe that satisfaction and performance are correlated? Possible sources of a commonsense theory. *Journal of Organizational Behavior*, *24*(6), 753–777. https://doi.org/10.1002/job.219

Fisher, C. D., & Noble, C. S. (2004). A within-person examination of correlates of performance and emotions while working. *Human Performance*, *17*(2), 145–168. https://doi.org/10.1207/s15327043hup1702_2

Fisher, C. D., & To, M. L. (2012). Using experience sampling methodology in organizational behavior. *Journal of Organizational Behavior*, *33*(7), 865–877. https://doi.org/10.1002/job.1803

Fritz, C., & Sonnentag, S. (2009). Antecedents of day-level proactive behavior: A look at job stressors and positive affect during the workday. *Journal of Management*, *35*(1), 94–111. https://doi.org/10.1177/0149206307308911

Geng, Y., Ji, W., Wang, Z., Lin, B., & Zhu, Y. (2019). A review of operating performance in green buildings: Energy use, indoor environmental quality and occupant satisfaction. *Energy & Buildings*, *183*, 500–514. https://doi.org/10.1016/j.enbuild.2018.11.017

Grund, S., Lüdtke, O., & Robitzsch, A. (2019). Missing data in multilevel research. In S. E. Humphrey & J. M. LeBreton (Eds.), *The handbook of multilevel theory, measurement, and analysis* (pp. 365–386). American Psychological Association.

Iida, M., Shrout, P. E., Laurenceau, J.-P., & Bolger, N. (2012). Using diary methods in psychological research. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA handbook of research methods in psychology, vol. 1. Foundations, planning, measures, and psychometrics* (pp. 277–305). American Psychological Association.

Intille, S. S., Rondoni, J., Kukla, C., Ancona, I., & Bao, L. (2003, April 5–10). *A context-aware experience sampling tool*. CHI EA '03: CHI '03 Extended Abstracts on Human Factors in Computing System, Ft. Lauderdale, Florida, USA. https://doi.org/10.1145/765891.766101

Korunka, C., & Kubicek, B. (2017). *Job demands in a changing world of work*. Springer.

Kunin, T. (1955). The construction of a new type of attitude measure. *Personnel Psychology*, *8*(1), 65–77. https://doi.org/10.1111/j.1744-6570.1955.tb01189.x

Kyriakou, K., Resch, B., Sagl, G., Petutschnig, A., Werner, C., Niederseer, D., Liedlgruber, M., Wilhelm, F. H., Osborne, T., & Pykett, J. (2019). Detecting moments of stress from measurements of wearable physiological sensors. *Sensors*, *19*(17), 3805. https://doi.org/10.3390/s19173805

Lindberg, C. M., Srinivasan, K., Gilligan, B., Razjouyan, J., Lee, H., Najafi, B., Canada, K. J., Mehl, M. R., Currim, F., Ram, S., Luden, M. M., Heerwagen, J. H., Kampschroer, K., & Sternberg, E. (2018). Effects of office workstation type on physical activity and stress. *Occupational and Environmental Medicine*, *75*(10), 689–695. https://doi.org/10.1136/oemed-2018-105077

Nezlek, J. B. (2020). Diary studies in social and personality psychology: An introduction with some recommendations and suggestions. *Social Psychological Bulletin*, *15*(2), 1–19. https://doi.org/10.32872/spb.2679

Ohly, S., Sonnentag, S., Niessen, C., & Zapf, D. (2010). Diary studies in organizational research. *Journal of Personnel Psychology*, *9*(2), 79–93. https://doi.org/10.1027/1866-5888/a000009

Reis, H. T., & Gable, S. L. (2000). Event-sampling and other methods for studying everyday experience. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 190–222). Cambridge University Press.

Reis, H. T., & Wheeler, L. (1991). Studying social interaction with the Rochester interaction record. *Advances in Experimental Social Psychology*, *24*, 269–318. https://doi.org/10.1016/S0065-2601(08)60332-9

Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological momentary assessment. *Annual Review of Clinical Psychology*, *4*(1), 1–32. https://doi.org/10.1146/annurev.clinpsy.3.022806.091415

Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. Oxford University Press.

Soucek, R., & Rupprecht, A. (2020). Supervisor feedback as a source of work engagement? The contribution of day-to-day feedback to job resources and work engagement. *EWOP in Practice*, *14*(1), 70–89.

Soucek, R., & Voss, A. S. (2021). *Pictorial scales on work intensity*. https://doi.org/10.17605/OSF.IO/93KTQ

Soucek, R., & Voss, A. S. (2022a). *Rethinking the assessment of work intensity – Development and validation of a verbal questionnaire and pictorial scales* [Manuscript submitted for publication].

Soucek, R., & Voss, A. S. (2022b). A picture is worth a thousand words: Pictorial scales for the assessment of work intensity. *EWOP in Practice*, *16*(1), 45–59.

Thai, S., & Page-Gould, E. (2018). ExperienceSampler: An open-source scaffold for building smartphone apps for experience sampling. *Psychological Methods*, *23*(4), 729–739. https://doi.org/10.1037/met0000151

Thayer, J. F., Verkuil, B., Brosschot, J. F., Kampschroer, K., West, A., Sterling, C., Christie, I. C., Abernethy, D., Sollers, J. J., Cizza, G., Marques, A. H., & Sternberg, E. M. (2010). Effects of the physical work environment on physiological measures of stress. *European Journal of Preventive Cardiology*, *17*(4), 431–439. https://doi.org/10.1097/HJR.0b013e328336923a

Thoresen, C. J., Bradley, J. C., Bliese, P. D., & Thoresen, J. D. (2004). The big five personality traits and individual job performance growth trajectories in maintenance and transitional job stages. *Journal of Applied Psychology*, *89*(5), 835–853. https://doi.org/10.1037/0021-9010.89.5.835

Wheeler, L., & Reis, H. T. (1991). Self-recording of everyday life events: Origins, types, and uses. *Journal of Personality*, *59*(3), 339–354. https://doi.org/10.1111/j.1467-6494.1991.tb00252.x

Wheeler, L., Reis, H., & Nezlek, J. B. (1983). Loneliness, social-interaction, and sex-roles. *Journal of Personality and Social Psychology*, *45*(4), 943–953. https://doi.org/10.1037/0022-3514.45.4.943

Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2009). Work engagement and financial returns: A diary study on the role of job and personal resources. *Journal of Occupational and Organizational Psychology*, *82*(1), 183–200. https://doi.org/10.1348/096317908X285633

Zhang, Z., Zyphur, M. J., & Preacher, K. J. (2009). Testing multilevel mediation using hierarchical linear models: Problems and solutions. *Organizational Research Methods*, *12*(4), 695–719. https://doi.org/10.1177/1094428108327450

Zohar, D., Tzischinski, O., & Epstein, R. (2003). Effects of energy availability on immediate and delayed emotional reactions to work events. *Journal of Applied Psychology*, *88*(6), 1082–1093. https://doi.org/10.1037/0021-9010.88.6.1082